

THE TURN TO THINGS: Arguments for a Sociological Theory of Things

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Things and artifacts are usually treated in sociological theory as marginal, irrelevant, or passive with respect to the production of social order. In contrast to that, in the past decade the sociology of knowledge and science has developed several approaches that stress the processual character of the cognitive relationships between human actors and artifacts. In this perspective, both human actors and things appear as active entities involved in the production of social order. As knots of socially sanctioned knowledge, things shape the temporal structures, allowing for social order to be stabilized and reproduced. From the viewpoint of the cognitive relationships between human actors and things, the distribution and transfer of cognitive properties and dispositions in a network of such relationships is central with respect to these processes. Starting from a detailed examination of these arguments, this article argues that social order cannot be conceived exclusively as a web of intersubjective relationships. It discusses the methodological and conceptual implications of treating artifacts as active social entities, arguing for their general theoretical relevance with respect to the ways we conceive the constitution of society.

Let this ring be accursed!
As its gold gave me power without limit
Let its spell bring now death to its bearer!
Let no happy man delight in it
Let no fortunate soul enjoy its shining gleam
Let whoever possesses it be consumed with care
And whoever does not be gnawed with envy . . .
Let its possessor hoard it without pleasure
But let it bring the murderer upon him . . .
Let him long for death, the Ring's Lord
As the Ring's Slave . . .

Richard Wagner
The Ring of the Nibelungen

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THE PLACE OF THINGS IN SOCIOLOGICAL THEORY

The picture offered by Alberich's curse is quite grim: as the dwarf finds out that the ring giving its bearer power over the Rhine's treasures has been stolen from him, he casts the curse upon the possessor of this particular object. Needless to say, Alberich himself had stolen the ring from the Rhine maidens. Apparently, interacting with things was not very commendable in those days. However, this bleak picture corresponds to a large extent to the widespread belief that longing or caring too much for things has destructive, dehumanizing consequences: they can destroy the social fabric, one's moral fiber, one's feelings, and indeed, every trace of humanity. Things can lead to the dissolution of the social norms that hold people together: what better example for the destructive power of things than the chain of thefts, lies, and betrayals they bring about in the Wagnerian society? There is of course the composer's hidden critique of capitalism in this passage: not accidentally, one of the most acclaimed productions at the Bayreuth Festival staged Wagner's cycle in an early capitalist set. Nonetheless, what strikes the reader is the counterintuitive way in which the relationship between humans and things is put forth: one desires them, but there is little delight; one is consumed with care, and there is more than one doubt that one could ever really possess them. Things seem to be quite active: their simple presence dissolves social norms, arouses desire, makes people cheat, lie, and (sometimes) fall in love. They are the dynamic nodes of human contact keeping the Wagnerian society on the move: (inter)actions and the plot's order are organized around them.

Literary examples in which things are active abound (consider the subgenres of "fantasy" fiction or the French *nouveau roman* popular in the 1950s and 1960s).¹ In certain discursive practices, such as literature, things are presented as active, complex (sometimes rebellious) order-generating entities. In contrast, their treatment in some varieties of contemporary sociological theory looks more contradictory.² At first glance, things seem to be marginal or liminal (Turner 1969): they are neither inside nor outside the social order. For example, a recent account of the conceptual foundations of social order and society ascribes to physical objects an ambiguous role: they are subjected to the imposition of collective agentive functions by human actors, as in the case where people agree to use a bench for sitting on (Searle 1995, p. 38). More importantly, these agentive functions are not always "performed solely in virtue of the object's intrinsic physical features . . . but can be performed only in virtue of collective agreement of acceptance" (p. 39). This investment with agentive functions by simple agreement makes artifacts crucial with respect to the creation of institutional facts and hence to the social order. At the same time, they remain outside such facts, which are a matter of agreement among human actors. Niklas Luhmann's (1990a, p. 3) systemic theory of society seems to ban things altogether from the realm of social systems into that of the environment, since they cannot fulfill basic systemic requirements: information, utterance, and understanding. Artifacts and objects of everyday life, as well as "natural" objects, are ascribed to the "socially external environment" and not to the social system(s) proper (Luhmann 1990b, p. 419). This nicely illustrates the liminal position that objects occupy in such accounts: since society is to be understood as the unity of all the differences between system and environment (Luhmann 1990b, p. 420), it follows that things have to occupy a place somehow. But, since they are always "environment", it follows that they stay outside. Jürgen Habermas's (1984, p. 100) world doesn't reserve a better place for things either: at best, they can be taken to belong to the "objective world," as unspecified entities about which true statements are

possible. But they certainly are not part of the "social world", that is seen as the sphere of "legitimately regulated interpersonal relations" (pp. 88, 100).

In contrast to such views, in the past decade the sociology of knowledge and science³ has shown a sustained interest in the reconceptualization of things and artifacts as social entities that play an active part in the generation, stabilization, and reproduction of social order and sociality. These approaches have a more general theoretical character, aimed at defining a sociologically encompassing conceptual frame that accounts for things as *active* social entities. Such arguments about the sociality of things are of interest with respect to a series of general theoretical issues: the constitution of social order, its reproducibility, the emergence and character of social institutions,⁴ and the interweaving of power and cognitive processes in the generation of order.

The present article outlines the conceptual premises on which the sociology of knowledge and science grounds the analysis of "things-centered" forms of sociality. It examines three of the points critical to the social role of things: (1) the constitution of social order, (2) the emergence of artefact-bound temporality structures, allowing for stabilizing and reproducing social order, and (3) the forms of social power engendered by things. A central argument, developed in the second part of the article, is that the notion of socially active things is anchored in a practice-theoretical perspective in which the social production of knowledge plays a key role. In this sense, knowledge processes are seen as a bridging element that allows us to follow the social role of things in the three above points. Another central argument is that the knowledge-sociological analysis of things shifts the focus of attention from separate, distinct entities to the processes out of which order emerges. In the perspective of the continuous processes of stabilizing, reproducing, and accounting for social order, the sharp distinctions among separate entities are effaced. The next part discusses the emergence of temporal structures out of the cognitive interactions between human actors and artifacts and the role of such structures in the reproduction of social order. With respect to the forms of social power engendered by things, three concepts are key: networks, hybrids, and translations. In the fourth part, I discuss these concepts, their relationship to the notion of temporal structures, and the contention that they can account for an emerging form of social organization centered on technical-economic entities. In this light, the conclusion outlines the directions of inquiry that should be pursued by a general sociological theory of things.

SOCIAL PRACTICES AND THINGS

Since the mid-eighties, sociologists of knowledge and science have directed their attention toward shedding new light on the part played by engines, measuring instruments, laboratory probes, detectors, and engineering devices in nesting and structuring social relationships (e.g., Latour 1987; 1988; 1990; 1994; Latour as Johnson 1988; Callon 1986; Law 1993; Callon and Latour 1992; Star 1991; Pickering 1995; Rheinberger 1992; Knorr-Cetina 1997). Grasping the things in a scientific laboratory is not a simple task. Sometimes they are huge assemblages of engines, measuring instruments, and machines built in order to conduct complex experiments, as in nuclear physics (Law 1993; Knorr Cetina 1999; forthcoming). They can also be large technical systems, with some mobile and some fixed parts, implanted in and overlapping with certain social sites as in the case of the ARAMIS transportation system discussed by Bruno Latour (1996). But they can also be something very small such as laboratory probes or paper-supported visualizations of DNA structures

(Rheinberger 1992; Knorr Cetina and Amann 1990). In some cases, things are engineering blueprints, designs, and schemes (Henderson 1991), the existence of which is paper- or computer-supported (the latter case makes the situation even more complicated). Finally, a thing may be a string of mathematical formulas (Heintz 1993), a combination of blackboards, of computer memories, or of screens (Star 1989). In all these cases, they are not determined by their intrinsic qualities, by some "given" or "natural" material properties as prior and opposed to the social interactions of the laboratory. Such oppositions, as we shall see, are quite problematic. Neither are the things of the lab determined by a direct, undiated relationship with the knowing subject. Some things are too large, too complex, or too ephemeral to be grasped in their entirety by one person, and, more importantly, knowledge is not an individual activity. Sometimes it is quite difficult to tell where things begin and where they end or to distinguish between their "harder" and "softer" parts. For example, it is hard to distinguish between the "hard" and "soft" parts of a computer-controlled centrifuge, where the instrument's concrete movements and functions are controlled and monitored by a piece of software whose materiality is difficult to pin down.

Due to their considerable variety and complexity, the things encountered in a scientific laboratory present the sociologist with a series of challenges: how to account for their role in the production and stabilization of scientific knowledge that is at the same time dependent on local conditions and valid beyond the walls of a particular lab, and how to account for the role things play in the social order of the laboratory.

In meeting these challenges, the starting premise has been to "describe scientific research as action, and to understand scientific knowledge as implicated in and produced by that action" (Barnes, Bloor, and Henry 1996, p. 110). In this case, one has to take into account that the doings of the laboratory imply not only the explicit kind of knowledge (that which is amenable to description in abstract logical terms) but also the tacit kind of knowledge necessary in handling and tinkering with the things in the laboratory. In fact, this tacit knowledge shared by the participants in the setting of the laboratory makes possible the unfolding of common activities and has conceptual and ontologic priority with respect to the explicit norms of scientific inquiry, as well as to propositional, discursive knowledge. If this is the case, the things of the laboratory have to be seen in the light of this tacit knowledge that allows human actors to interact with them. This occurs under the premise that they are grasped as "congealed mass(es) of human labour" (Marx [1867] 1977, p. 142) and hence as materially inscribed knowledge. According to this picture, objects of scientific inquiry (taken as instruments and objects of epistemic scrutiny) are anything but given, at the disposal of the inquiring subject, opposing a passive resistance to it, or waiting to be scrutinized. What makes an instrument or engine relevant and valuable in a scientific context is the fact that it can be recognized and put to work by the participants as a "congealed quantity of labour" (p. 150)—that is, as knowledge already there. A transfer pipette is a transfer pipette in a laboratory setting not by virtue of some intrinsic property or because of some higher authority or norm but because (1) it incorporates a certain amount of recognized knowledge about measurement procedures, about the physical properties of liquids, about the relationship between pressure and volume, and so on, (2) it requires a certain knowledge, like how to apply pressure, and (3) it allows at the same time the actors of the laboratory to set courses of action. It follows that the actors in a laboratory put to work the knowledge at hand and that only part of it is human borne. This has in the first place a tacit character and consists in the skills and abilities to interact with things such as measuring instruments, laboratory probes, engines, and the like. Skills and abili-

ties, essential to scientific activities, are mundanely (re)produced in the work with material constellations of knowledge, as a response and adaptation to them. On the one hand, we have then certain material configurations of knowledge, demanding skills and abilities that are acquired in the mundane interactions with them. On the other hand, we have the human actors of the lab modifying and adapting their knowledge to the material at their disposal, as well as producing and picking out new material configurations, according to what they already know. This echoes George Herbert Mead's (1982, p. 122) observation that things answer to the attitudes we have formed to them and that our attitudes adjust to things.

The tinkering in the lab means, at a basic level, this tacit, continuous process of reciprocal adaptation of practical skills and materialized knowledge. At a further level, it means being guided by and using the given epistemic resources in the successful production of knowledge. These artefactual epistemic resources define the local setting through their spatial arrangements that constrain the actions of human actors; as Mead (1982, p. 119) noticed, distance and spatial configuration is a matter of responses and contacts that define the possibilities for action. Moreover, artefactual resources can also enlarge the zone of cognitive operation (Schutz and Luckmann 1973, p. 44) and therefore determine the human actors' possibilities for action. For example, some studies of laboratory settings have stressed their apparently cramped character, where various instruments, measuring devices, and other things are piled on top of each other in a seemingly disorderly fashion (e.g., Latour and Woolgar 1979). This is neither due to some lack of space nor does it reflect some disorderliness inherent in scientific work. On the contrary, the lab's spatial configuration is very ordered and precise, determined by the frequency with which researchers put to work certain skills and abilities incorporated in artifacts. Instruments and devices are arranged according to the experiments being performed, to their sequential order, and to how the instruments relate to each other and to the human actors in the course of these experiments. The lab is constituted as a configuration of cognitive interactions between human actors and things. Distances and positions are grounded in cognitive relations and actions, providing a "distinctive phenomenal field(s) in which organizations of 'work' are established and exhibited" (Lynch 1993, p. 132).

If the possibilities for action are defined by epistemic resources, then the generation of social order is coextensive with the process of knowledge production. The social order of the laboratory cannot be seen as a kind of external, given frame with respect to the production of knowledge. Since the starting point of this process is given by the practical doings through which human actors adapt their skills to the knowledge at hand, modify this according to their own abilities, and at the same time coordinate each other's doings according to adaptation processes, it follows that a contextual, stable, reproducible social order is achieved in (and not outside) the production of knowledge. Seen in this perspective, the things of the lab appear *both* as the fundamental resources of this specific form of sociality and as setting up the rules by which action unfolds. They are neither ready-made for scrutiny nor passive instruments: this means that they have to be practically configured, according to the said conditions, to the epistemic resources of the human actors but also, according to those incorporated by the other things present in the lab. At times, things can be also configured, modified, or rearranged, according to which cognitive resources are out of order. In her ethnography of a laboratory, Karin Knorr-Cetina (1981, p. 35) shows how a broken lab instrument led to a cognitive redefinition of other lab devices, starting from the skills at hand: scientists used a centrifuge as a replacement for the broken

instrument, although this was not their usual way for performing measurements. In this case, the measurement had to be redefined according to the skills and abilities required by operating the centrifuge and according to the kind of knowledge (e.g., about separating substances and densities) incorporated in a centrifuge. Tinkering according to the available material knowledge led in this case to an ingenious redefinition of the scientists' problem. The practical achievement of things, indistinguishable from the process of knowledge production and from the production of an accountable social order, means that objects are not only "technically" manufactured in laboratories but are also inextricably symbolically or politically construed, for example through literary techniques of persuasion such as one finds embodied in scientific papers, through the political stratagems of scientists in forming alliances and mobilizing resources, or through the selection and decision translations which "build" scientific findings from within" (Knorr-Cetina 1992, p. 115).

This entails shifting the analytical focus from two distinct and separate entities—active human actors and things opposing a passive resistance to epistemic inquiries—to the processuality at work in generating and reproducing the social order of scientific laboratories as "collective units which encapsulate within themselves a traffic of substances, materials and equipment, and observations" (Knorr-Cetina 1992, p. 128). Such a shift in focus, from "final products to production, from 'cold' stable objects to 'warmer' and unstable ones" (Latour 1987, p. 21), reveals how things are integrated into the social order of the laboratory as knots of socially sanctioned and active knowledge and how they help shape and stabilize the social order of knowledge production. In his study of Louis Pasteur's laboratory, Latour (1988, p. 81) shows how small things and instruments, such as the pipette and the culture medium, played a decisive role in defining the specific order of the lab "out of the movement and displacement of other places and skills," thus enabling the unfolding of medical knowledge. For example, building up an adequate culture medium meant first learning how to make a broth resembling cooking stock and then a good gelatin that was essential for growing the anthrax microbe *in vitro*. These were cooking skills, which had to be translated and reembedded in the context of the laboratory, and that afterward also enabled the translation (and transformation) of the microbes themselves—with these latter becoming a scientific fact, visible evidence of the disease, and so on. The culture medium represented new practical skills integrated into the social order of the lab, skills that in their turn reshaped the skills of laboratory workers and researchers.

In some cases, this practical codependency between knowledge embodied by the researchers and knowledge incorporated in the instruments of research becomes so great that it is difficult to distinguish where one ends and the other begins, as in the case of systems of distributed artificial intelligence or of complex engineering systems, "monstruous group(s) which regulate interaction between graphite rods, turbines, atoms, operators, control boards, flashing lights, concrete slabs and engineers" (Callon 1991, p. 141). Latour (1993, p. 11) calls this practical codependency a "work of hybridization," that is by no means limited to complex technical systems but is rather a general characteristic of the social order.

THINGS, KNOWLEDGE, AND TEMPORALITY STRUCTURES

This view of things as concrete forms of social knowledge, as processes enmeshed with other processes embodied by human actors, raises the question of the way they relate to the temporal structures of scientific knowledge production. By definition, a key feature of

such processes must be their temporal dimension, their ability to unfold over time, to develop their own rhythms. At the same time, they structure and stabilize the social order (of the laboratory), which means that they have to play a role in the temporality structures intrinsic to social order.

One argument about how things generate temporal structures has been formulated by Jorg Rheinberger (1992) and Karin Knorr-Cetina (1997). They argue that, while constituting a basic epistemic resource of the lab, instruments, experimental probes, and engines are also continuously modified, adapted, or expanded, according to the constraints and demands of the knowledge constellation in which they are embedded. The things of the laboratory incorporate a knowledge that is already there; at the same time, they are achieved as new knowledge in the process of scientific inquiry. A pipette, for example, incorporates an already available knowledge about the relationship between pressure and volume of liquids. Concurrently, when being used in new ways in new experiments, a pipette can unfold new knowledge. Therefore, things should be seen simultaneously as given knowledge and as knowledge-in-the-making. Being knowledge-in-the-making, they are active in the sense that they are part of the continuous processes that reshuffle the knowledge bases of a specific form of sociality. One example of such open-ended, always-in-the-making knowledge is provided by software codes that are never actually finished; we have only temporary varieties and versions of such codes, certain to be replaced or upgraded.

This reshuffling aspect of epistemic things is perhaps even more evident in domains such as software design or computer-aided engineering that rely on boundary objects (Star 1989; Henderson 1991; Fujimura 1992). Engineering blueprints, blackboard drafts, maps, and software codes are continuously reshuffled—they never really get done once and for all. This allows them to create and combine different time horizons (Star 1989, p. 47) and to keep together scientists that may have different goals, different units of analysis, or different audiences. An example of boundary objects is atlases of the brain (Star 1989, p. 49), which are visual representations or maps of the brain's sections and regions, used in both basic research and brain surgery. These maps combine the different time horizons of brain surgeons and neurophysiologists, while connecting these user groups with their own specific goals and practices. What keeps the human actors of a scientific lab together is exactly the fact that they are embedded in an ever-changing flow of knowledge: the tasks they set to their common work never really get to an end. Scientific groups and communities, although task bound, do not fall apart when these tasks are achieved. The achievement is not final, and the scientific activity is open-ended, thus strengthening the cohesion of such communities. In the common, practical acquisition of skills and abilities in interacting with open-ended things, these latter appear as a self-expanding epistemic resource that imposes its own rhythm on human actors and generates two tightly interwoven kinds of knowledge: (1) knowledge as an end result and (2) reflexive, processual knowledge. Andrew Pickering (1995, p. 21) has designated this as "the dance of agency," by which he means that laboratory instruments and objects of inquiry play an active part in the unfolding of this process of knowledge. With the reactions of lab instruments being not very foreseeable most of the time, human actors have to "retreat" while machines process and produce some material results—dots of light, patches of color, patterns of lines. With these, machines force human agency to come into play, in that lab actors have to revise their interpretations and actions, as well as devise further actions according to the material results produced by machines (Pickering 1995, pp. 22–27). In having to wait for mate-

rial results, human actors "encounter a time structure that is imposed on [them]" (Schutz and Luckmann 1973, p. 48). One has to note here that this more general point is also present in Marcel Mauss's discussion of gift exchange, as well as in Jacques Derrida's redeployment of this discussion. Starting from Mauss's contention that the phenomenon of gift exchange implies the reciprocal determination of the "law of persons" and the "law of things" (Mauss [1925] 1954, pp. 48–49), Derrida (1992, p. 40) notices that the doings of the human actors are embedded in the temporal structures of the relationships between things (a gift requiring a certain kind of counter-gift, after a certain lapse of time, in the context of a certain kind of presentation): "The thing itself demands gift and restitution, it requires therefore 'time', 'term', 'delay', 'interval' of temporization, the becoming-temporization of temporization, the animation of a neutral and homogeneous time by the desire of the gift and the restitution. . . . This demand of the thing, this demand for term and temporization, would be the very structure of the thing."

Temporization and temporalization thus become central features of epistemic practices. The first means that in the practical work with artifacts, the achievement of once-and-for-all results or knowledge is continuously deferred and that the actual achievement of this practical work is the process itself, as the source from which knowledge unfolds: "The movement of signification is possible only if each so-called present element, each element appearing on the scene of presence, is related to something other than itself, thereby keeping within itself the mark of the past element, and already letting itself be vitiated by the mark of its relation to the future element, this trace being related no less to what is called the future than to what is called the past, and constituting what is called the present by means of this very relation to what it is not" (Derrida [1972] 1990, pp. 65–66). These deferrals actually both stabilize and align the social order of the laboratory to the larger, outside order (Pickering 1995, p. 182). In this context temporalization means that knowledge processes surpass momentariness in this way: in the process of postponement, they gain a stable, temporal dimension. A key consequence is that epistemic practices become temporally stable and acquire the luster of coherence.

John Law (1993) and Karin Knorr-Cetina (1999) have also turned their attention toward how complex machines—such as those used in large experiments in the field of particle physics—organize human actors and act as open-ended epistemic things. In big experiments, on a large time scale, the objects of inquiry do not appear as fully achieved. For example, many experiments in nuclear physics, aiming at detecting or tracing the behavior of subnuclear particles, are done and redone over many years and involve the large-scale organization of hundreds of scientists around huge, complex engines. In such cases, there is no talk about tracing a stable, unchanging entity but rather several varieties of the same "particle", which, in its epistemic dimensions, depends on these reflexive processes of reshuffling and unfolds over long periods of time. A similar example is the case of large technical systems encountered in everyday life, such as the computerized urban rail system studied by Latour (1996). Such a system implies the social organization of engineers, technicians, workers, and passengers around a huge, dispersed engine with some fixed and some mobile parts. The engine never gets done once and for all, since it implies continuous maintenance, monitoring, repairs, extensions, re-arrangements, and so on. In this perspective, the engine represents a constellation of processual forms of knowledge, creating a stable temporal dimension, binding and organizing human actors around it. The forms of sociality specific to scientific inquiry—and, more particularly, the communitarian features of scientific work in large experiments—have the interaction with responsive, "active" things at their core.

However, it would be inappropriate to think that only big, technically complex machines can structure the temporal order of interactions and activity. In his ethnography of a residential ward for mentally handicapped teenagers, Ruud Hendriks (1997) shows how the small things of everyday life, such as rugs, benches, and egg timers, structure the temporal sequences of interaction for both residents and health workers. If we take the case of simple, apparently nonproblematic doings, such as eating a hamburger, we are still confronted with the problem of achieving a temporal sequence—that is, of beginning, continuing, and finishing the hamburger. It is the socially accountable achievement of this temporal sequence that makes the doing a meaningful action. This temporal sequence is achieved by the ward's residents with the help of props such as an egg timer, which order the way they relate to their food (e.g., the hamburger is finished after a complete rotation) and to their bodily movements (like taking a bite each couple of ticks). Mental health workers relate themselves to the doings of the residents via things like egg timers, in order to manage and stabilize a temporal ordering for the ward. Thus, material objects are no longer seen "as passive means in the hands of the counselor, as neutral service-hatch for meanings to be passed through, but as *nodes* around which other elements (counselors and residents, words, gestures, organizations, things, bodies) are temporally centered. Temporal order, then, is seen no longer as an elusive concept, to be found solely in the heads of the counselors or in the linguistic community, but as a result of the ways in which heterogeneous elements in their mutual interaction perform agency in temporal affairs. As a derivative of the (partly) material labour of ordering" (Hendriks 1997, p. 252).

In other words, objects of knowledge (and large, complex ones even more so) bind human actors and participate in developing specific forms of social order—because they allow for common practices to develop, stabilize, and structure time. This position echoes Martin Heidegger's ([1927] 1977, p. 93) stance that human reflexive practices (and hence "Being") arise in the everyday care for objects, in tinkering around them, and in trying to respond to their challenges.

These arguments point to the fact that at least some of the things at work in social settings have an open-ended, processual character and contribute to generating temporality structures that ensure the coherence and stability of social order. Through a continuous deferral of the final tasks and through generating a multitude of sequential, partial tasks that have to be reiterated all the time, such epistemic engines reinforce and reproduce the social bonds of the community: they allow for the human actors to perceive their activities as common, reinforced by affective bonds, and directed toward care and stability. In the case of multinational scientific collectives, they allow for the members of the community to develop "a culture of no culture" (Latour 1990, p. 166)—that is, to achieve cohesion and coherence in spite of their national or local particularities, of the differences in social traditions and customs, social background, language, and so on.

Thus, we are provided with different modes in which things constitute the temporal structures of social order: (1) Temporal structures are grounded in the cognitive processuality of things and of the accountable doings of human actors. These structures are achieved in the ordered interactions between human actors and things. (2) Being processual, epistemic things create an open temporal sequence that never closes (or closes only over large time spans). This allows for goals, tasks, and interests to be adapted to this structure and then temporized. Such open-ended structures enhance social cohesion, as in the case of scientific communities centered around complex things or constellations of things. (3) Since the things of the lab and the human actors are codependent in the practi-

cal skills they incorporate or embody, respectively, it follows that they have to wait for each other and to adapt to each other through a "dance of agency." The continuous process of reciprocal adaptation stabilizes social order and provides it with continuity. (4) This stabilization of social order does not imply its identical reproduction, which would be problematic anyway. Rather, the open-endedness of temporal sequences together with the temporization implied by reciprocal adaptation allow for ruptures and epistemic rearrangements, as in the cases of scientific discoveries and controversies.

THINGS, KNOWLEDGE, AND POWER

If things, seen as materialized knots of practical knowledge, play an active role in generating structures of social order and if we accept Michel Foucault's (1979) thesis that they knowledge processes underwriting social order are also entangled with structures of social power, then we may rightly inquire about the part played by things in such power structures. Starting from the premise of things as knots of practical knowledge that interact with those embodied in human actors, Latour has outlined how things are entangled with such structures of power. His arguments unfold from three issues: (1) the operations of classification, as well as the categories through which human actors achieve specific distinctions between themselves and things, (2) the conceptual possibilities for human actors grasping things, and (3) the social operations of transplanting things between different locales or "labs", and their more important consequences.

As for the first issue: the asymmetry of the categories "human" and "nonhuman" (echoed in the fundamental distinctions between society and nature, humans and things) is not self-evident, given or natural but is rather the product of socially sanctioned classification operations and categories, and therefore an epistemic operation to be examined in its own social character. This argument continues the stance adopted by Émile Durkheim ([1915] 1947, pp. 147-148), according to which the distinction humans/nonhumans is achieved through practical operations of classification. Therefore, one has to examine their eminently practical character (Latour 1988, p. 186). Considering that laboratory artifacts are material knots of knowledge, these operations are seen as performed by the practical skills required in getting on with things. On the one hand, artifacts are certain materialized skills and knowledge and require from human actors complementary skills and knowledge. On the other hand, both human actors and artifacts can meaningfully act (and work, respectively) in a system of differences among kinds of (tacit) knowledge. A door, for example, materializes a certain practical knowledge (about buildings) and requires practical knowledge and skills from those who wish to open it (Latour as Johnson 1988, pp. 299-300). At the same time, a door can be grasped as material knowledge only if we take into account the differences between the work it performs and the work performed by alternative material knowledges (like that of walls, or of holes in walls) (Latour as Johnson 1988, p. 306). If we see both artifacts and human actors as (different) bearers and producers of knowledge, depending on each other and acting/working only in this system of differences, then their positions with respect to each other are the result of practical operations of classifying through the ascription and enactment of skills and tacit knowledge. At the methodological level, however, this questions the assumption that humans and artifacts must be approached differently.

The conclusion (Callon and Latour 1992, pp. 348-349) is that methodological asymmetry is not justified: one can study the social processes that generate epistemic asymme-

try with symmetric methodological assumptions (Latour 1993, pp. 94-95). Methodological symmetry is *not* to be confused with ontological symmetry. Ontological symmetry would imply some form of animism—that is, ascribing intentions, aims, and purposeful action to artifacts; methodological symmetry implies analyzing both human actors and artifacts as generators of practical knowledge. Thus, the methodological assumptions that apply to human actors would also apply to things and there would be no methodological reason for treating the two asymmetrically. What the sociologist has to do is to follow the attribution of properties on both sides of the divide (Latour 1993, p. 96); seen as a practical work, this attribution constitutes sociality's very core. This position grounds the approach to human and nonhuman participants in knowledge processes as "actants"—that is, as entities embedded in practical configurations whose interactions generate (scientific) knowledge. These networks of humans and machines are stabilized over time and tend to expand. One such example of practical configurations is found in huge technical systems, like the transportation system discussed by Latour (1996). One question remains, though: while a symmetrical methodology may apply, social order is still consistently and successfully taken by human actors as asymmetric. Therefore, one would have to question—with a symmetrical methodology—the socially successful production of asymmetry, or what Pickering (1995, p. 245) has termed the achievement of "performative incommensurability." Bruno Latour and Michel Callon (Latour 1993; Callon and Latour 1992) take asymmetry only as a historical obliteration—as the "Great Divide" of modern times. This divide is partly the result of a paradigm shift in the way we conceive the relationship between knowledge and politics (Latour 1990) and partly the result of social forces that in the process of modernization obscure the role played by things, making them appear as receptive to the will and intentions of human actors. Without going into the details of Latour's argument, one must notice here the shift from a methodological to a historical topic—that is, from the general methodological assumptions in examining social practices to the question of whether modernity is marked by such an epistemic rupture with respect to things.

In direct relation to the aspects discussed above comes the second question posed by the actor-network approach, about the conceptual possibilities for grasping things. If the epistemic basis of the social order is given by establishing systems of differences and by the practical, nondiscursive, material operations of classification and category building, then things cannot be given: they must be assigned a place and marked as such. This applies not only to discursive practices but also to material practices of marking or inscribing objects. Moreover, artifacts inscribe or leave traces on other things, thus modifying them; scientific knowledge is in many cases generated in such processes of inscribing (Callon and Latour 1992, p. 351). For example, measuring instruments inscribe human actors with skills and abilities required to operate with them; most scientific practices also consist in producing inscriptions of objects of inquiry that otherwise cannot be investigated—such as the inscriptions or traces electrons leave in the bubble chamber (Pickering 1995, pp. 38-39). Inscriptions are then not just about artifacts but also constitutive of them. And because inscriptions can work only in a wider context, then inscribed things send to each other and defer meaning continuously. If we come to see both human actors and artifacts as configurations of practical knowledge (Latour 1988, p. 179) whose relationships are grounded in a processual, tacit work of reciprocal inscription and modification, then we have to grasp particular forms of sociality, or "tribes" (Latour 1993, p. 101) as dynamic constellations or networks, primarily stressing their character as process and less as the "nature" of their components (Latour 1988, p. 171).

Finally, there is the question of how artifacts (incorporating a particular, situated kind of knowledge) are translated from locale to locale. The first level at which translation takes place is that of translating material knowledge into human skills and abilities and vice versa (Latour as Johnson 1988, p. 299). This kind of translation disciplines the members of an epistemic constellation (p. 300). At a second level, translation (p. 306; Latour 1990, p. 154) designates the transfer of practical scripts (or knowledges) onto material bearers (e.g., when transferring the practical knowledge from a lab assistant onto an automated transfer pipette). Such "immobile mobiles" are transferred from locale to locale, bringing with them not only their knowledge but also their disciplining power. They mobilize and enlist human actors in their materially "frozen" knowledge. When "critical mass" is attained—that is, when there have been enough transfers (Latour 1990, p. 163)—the epistemic constellation that Latour (1988, p. 171) calls "a network of entelechies" attracts in its orbit more and more knowledge bearers by virtue of its mass, a process that occurs at the expense of other epistemic constellations. Seen in this perspective, scientific struggles are simply power struggles—it is only that they aren't fought by individual subjects but by such networks. Conversely, these power struggles are inextricably linked with epistemic processes and with science, since the generation, stabilization, and reproduction of networks implies absorption (or destabilization) of other networks. Knowledge and power are intimately linked, both in the way knowledge is generated in networks and in the ways networks enlist outsiders and expand. Artifacts play a central role in this process, since they inscribe and modify other objects, bringing them into the net; they "attach" human actors to the net; and they are instrumental in power struggles, where the "wealth of objects" (and hence of knowledge) counts. Hence the thesis that knowledge and politics "reverberate in each other" (Callon and Latour 1992, p. 364). This is precisely Foucault's thesis (1976, p. 120), which Latour (without particularly acknowledging it) seeks to expand by enlisting things and artifacts among the active dispositives of power.

In this perspective, the model of power/knowledge presents two essential features: (1) continuous expansion and accumulation and (2) the tying together of human actors and things in stable, hard-to-break cognitive relationships. On the one hand, the larger the network with its objects, the stronger its force will be, and hence its authority, legitimacy, and power. On the other hand, the core elements of this network are not simply human actors plus things but the epistemic relationships between them. These enacted relationships stabilize and reproduce such networks. Such epistemic relationships are simply "hybrids," meaning that they align and tie together humans and nonhumans.

This view of social power as accumulation and hybridization is a cornerstone for understanding the rise of "modern" societies and of capitalism. "Capital" is just an application running on this platform (Latour 1988, p. 172). It consists in a network-like accumulation of knowledge about the exchange of equivalents, which has already attained critical mass; therefore, "the marketplace is only a consequence of the establishment of networks" (p. 172). Moreover, what we call "modern" societies are just collectives (of human actors and things) that have managed to attain this critical mass, while "nonmodern" ones retain a subcritical mass (Latour 1993, p. 107). This model is grounded in a refined idea of accumulation, whose object is the process of epistemic relationships and not inert "wealth." It also supports the idea that "modern" capitalist societies are affluent ones: however, epistemic abundance is not simply tied to amassing things but rather to the notions of networks and hybrids. Networks of epistemic relationships unfold a mundane wealth of knowledge, the most important of which isn't explicit; they are also tied to temporal struc-

tures that allow for (relative) stability. Since these temporal structures are open-ended, they allow for an increase in the networks' complexity and for further accumulation. Also, hybrid alignments of humans and nonhumans grow more complex by including ever more heterogeneous components, which means that the knowledge they achieve (and require in their interactions) grows more complex and heterogeneous. This growing complexity enables them to absorb even more knowledge.

For Donna J. Haraway (1997, p. 12), the effect of such hybrid alignments is that of "technobio-power": "distributed, heterogeneous, linked, sociotechnical circulations that craft the world as a net called the global." Since "material, social, and semiotic technologies" bring human and nonhuman actors into alliance, and since this alliance leads to "a condensation in space and time, a speeding up and concentrating of effects in the webs of knowledge and power" (pp. 50–51), then technologies of knowledge (material, social, and semiotic) constitute the lines of force along which society is organized. With respect to that, economic processes would appear as epiphenomena, made possible by and relying heavily on such technologies: "Accelerated production of natural knowledge pervasively structures commerce, industry, healing, community, war, sex, literacy, entertainment, and worship. The world-building alliances of humans and nonhumans in technoscience shape subjects and objects, subjectivity and objectivity, action and passion, inside and outside in ways that enfeeble other modes of speaking about science and technology. In short, technoscience is about worldly, materialized, signifying and significant power. That power is more, less, and other than reduction, commodification, resourcing, determinism, or any of the other scolding words that much critical theory would force on the practitioners of science studies, including cyborg anthropologists" (p. 51).

Accumulation and expansion of epistemic networks, therefore, also mean an expansion of such "hybrids", which come to dominate economic processes: "Impurity, then, is the rule. Nowhere is this more visible than in the service sector. The product sold by Club Med, Cap Sogeti or CISI is a mixture of humans and non-humans, texts, and financial products that have been put together in a precisely coordinated sequence. Consider what it takes for Mr. Smith to be able (and willing) to spend his holiday on the banks of Lake Ranzuiroa, watching the Barracudas mingle with the tanned bodies of his fellow-humans. Computers, alloys, jet engines, research departments, market studies, advertisements, welcoming hostesses, natives who have suppressed their desire for independence and learned to smile as they carry luggage, bank loans and currency exchanges—all these and many more have been aligned" (Callon 1991, p. 139).

Callon takes over Latour's argument here, namely, that the marketplace (and market exchange) is just another network of cognitive relationships about the exchange of equivalents; he pushes this idea further, with the argument that economic exchanges are made possible, dominated, and controlled by hybrid epistemic formations. The exchange and consumption of commodities (such as holidays and travels, but not only) is conditioned by knowledge-based networks that make possible the constitution of a commodity as a practical alignment of human actors and things. Such alignments require a good deal of practical knowledge on the part of the consumer, about how to enter relationships with the different, human and nonhuman components of such a network. Commodities are dependent on network and, in fact, are constituted in and by them: we can hardly imagine a holiday package (or, for that matter, any other complex, technically sophisticated commodity) outside such a network of computer bookings, rapid transportation engines (airplanes, cars, etc.), computerized money transfers, advertising brochures, and so on. But consumers too are

constituted in and by such networks: in order to be able to access such a travel package, one needs several kinds of practical knowledge, from how to book flights to driving off-road vehicles, making transfer payments, comparing travel brochures, and much more. Such constellations of hybrid relationships are suffused with social power that cannot be located at any precise point or in any precise object or engine. What makes them so powerful is that these relationships regulate human actors' access to things. These relationships constitute the lines of force along which social life is organized.

This becomes more clear in Callon's (1991, p. 138) redefinition of money in terms of a network: "For instance, when venture capital funds research, this is based on a program of action, which acts as counterweight to the loan. In this money is textualised, translated into orders, indicators and recommendations. These define and link a range of heterogeneous human and non-human actors: cooperate with X at ICI and Y from Laboratory Z to obtain critical temperature of 150° K and you will get a loan of \$A. Here again the intermediary is a network of roles." This strategy is meant (1) to re-define economic exchange in cognitive terms, (2) to connect economic exchange, science, and technology on the ground of these cognitive terms, and (3) to re-define afterward the connection between scientific action and economic exchange in terms of power/knowledge. If market exchange (and, more generally, any economic process) is made possible by an epistemic network in which human actors and artifacts are aligned along cognitive processes (that are also lines of social force or power), then it becomes possible to describe economic processes in terms of this network and its alignments. Moreover, if networks' underwriting economic processes imply (1) complex alignments of human actors and artifacts, (2) the stabilization and maintaining of technological dispositives, (3) the open-ended production of knowledge, (4) the codependency of humans and artifacts, then we can describe the processes through which various entities (or, in Latour's terms, the entelechies of the network) are translated into each other. The processes through which instruments, machines, lab results, substances, natural elements are translated into money (or the other way around) are such cases. Finally, these translation processes have to be seen in terms of power/knowledge, since they (1) unfold along the essential lines of such a network, (2) play a central role in the processes of cognitive accumulation, and (3) expand the network. This would provide us with a platform for analyzing how science, technology, and economic processes are closely imbricated not only at the level of the macrosocial organization but, much more profoundly, at the mundane level of the cognitive processes that shape and structure social order.

CONCLUSION

The impact of the theoretical and methodological arguments discussed above goes well beyond the domain of the sociology of knowledge and science. Although supported by empirical examples and analyses from the domain of science, such arguments actually concern the possibility of devising a sociological theory that does not place artifacts on the margins or in the environment of the social world but accounts for them as social entities: "We have never been interested in giving a social explanation of anything, but we want to explain society, of which the things, facts and artifacts, are major components" (Callon and Latour 1992, p. 348). Thus, these arguments place themselves in a Durkheimian tradition, by treating artifacts not as given and inert, as simple clumps of matter lying around, but as social facts. Two elements are essential in approaching the sociality of things: (1) the tacit knowledge they incorporate, seen in its codependency with the tacit knowledge

embodied by human actors, and (2) their processual character, where we might see them as part of achieving and stabilizing social order. Since tacit knowledge and processuality are central to social practices, conceived as "temporally unfolding and spatially dispersed nexus(es) of doings and sayings" (Schatzki 1996, p. 89) in which an accountable order is achieved, then artifacts are active, integral parts of such nexuses.

Explaining Social Order through Symmetry and Asymmetry

Conceiving artifacts as active social entities does not preclude the fact that social practices are consistently and successfully taken by human actors as asymmetric. The supposition of asymmetry shared by human actors isn't necessarily reducible to a "romantic assumption . . . of the essential and a priori distinction between humans and all other kinds of entities that exist" (Ashmore, Woolfitt, and Harding 1994, p. 734). It requires rather an empirical examination of how it is enacted by human actors in the production of social order. Therefore, any sociological theory of things is confronted with two inter-related issues: (1) the issue of methodological symmetry—that is, of describing the processuality and shared cognitive grounds of human actors' doings and of artifacts in a network (this issue is *not* to be confused with ontological symmetry, with ascribing to artifacts intentions, a soul, etc.); and (2) while a principle of methodological symmetry applies, we are confronted with the issue of the successful production of asymmetry—that is, of the strategies and processes through which human actors take the social order as asymmetric, take themselves as radically different from artifacts, and their performances as incommensurable with those of artifacts. If the asymmetry of social order and social practices cannot be taken as given or "natural" any more, this does not mean that it is a nonissue. Rather, emphasis should be put on strategies and resources through which human actors manage to account for a social order in which they take themselves as different with respect to the artifacts to which they are related. One subordinated issue would be to examine the zones and domains of human activity in which this supposition and the strategies of asymmetry are suspended, such as certain literary genres, and to analyze and describe the social mechanisms that allow for such partial, local, and controlled suspensions. Therefore, applying the principle of methodological symmetry does not exclude but rather *requires* a systematic clarification of how social order is accounted for by human actors as asymmetric.

While Latour (Latour 1990, pp. 155–156) emphasizes methodological symmetry, he seems to view the second issue only in terms of a historical obliteration that begins in the seventeenth century, with inventing "a political discourse where politics should not count" (science) and "a scientific politics where experimental science should not count" (politics): "From now on every one should 'see double' and make no direct connection between the representation of non-humans and the representation of humans, between the artificiality of the facts and the artificiality of the Body Politic." However, "simultaneously showing the coproduction of society and nature . . . secreted as by-products of this circulation of quasi-objects" (Callon and Latour 1992, p. 349) also means showing the coproduction of differences between things and human actors, which are constitutive to social order. The second issue discussed above cannot be put only in terms of a historical "accident", but requires a more general clarification, that a sociological theory of things should pursue.

Exploring the Temporal Structures of Technical-Economic Networks

One aspect central to such a theory, and closely related to the above, is the following: if artifacts have to be seen as processes and as knots of socially sanctioned knowledge, then they mold the temporal structures of social order. This takes the form of reciprocal adaptation of different temporal dynamics, as in the case of boundary objects, of a temporization of social action, as in the case of the "dance of agency," of temporalization, or of complex, open-ended epistemic things. In each of these cases, the stress is put on the continuity and temporal stabilization of the social order, which allows for its reproducibility. The model here is that of an artifact or constellation of things upon which social action is centered. At the same time, we encounter in practice hybrid concatenations of human actors, engines, inscription devices, texts, that are heterogeneous with respect to the temporal structures they generate. This surfaces in the case of the technical-economic hybrids approached by Callon: seen in this light, travel services, for example, are concatenations of hybrids that generate different temporal structures for the various human actors involved in them. I will illustrate this problem with an additional example. Eurotunnel, the submarine tunnel linking France and Great Britain, can be regarded as a complex technical-economic network. It implies the coordination and supervision of several complex technical elements (high-speed, computer-controlled trains, rails, three interlinked, computer-monitored underwater tunnels, safety mechanisms, etc.), that are *interdependent with* financial ones (e.g., the instruments required by continuous debt refinancing or by the management of a complex property structure). The temporal structures ensuring the financial functioning of the network intermingle here with those specific to the network's technical elements. The question would be how heterogeneous temporal structures are brought together and coordinated and if new temporal structures emerge in this process. Haraway (1997, p. 12) notices that technical-economic hybrids (which she calls cyborgs) develop their own temporal modalities that are not always sequential. Condensation, fusion, and implosion (as opposed to development, fulfillment, and containment) are, according to Haraway, among these temporal modalities. Since they arise out of the "densely packed condensations of worlds" (p. 14), they question the notion of duration, of "continuity which persists throughout the waking life of the individual" (Giddens 1987, p. 60). For a sociological theory of things, the question would be (1) how heterogeneous temporal structures are brought together and stabilized in such complex technical-economic networks and (2) the ways in which they affect the constitution and reproducibility of social orders. This would require a concrete examination and description of such temporal modalities.

Exploring the Distributing of Properties in Technical-Economic Networks

A third aspect central to a sociological theory of things concerns the power structures arising out of such hybrid concatenations. Since these are understood as the lines of force along which social order is generated and society is organized, then these power structures are irreducible to political power; rather, they are understood as technologies that pervade everyday life, regulating and standardizing the possibilities for human action (Star 1991, pp. 36–37). On the other hand, it would also follow that political institutions make use of such technologies, and we can trace the ways in which material dispositions act as expressions and instruments of political power (Mukerji 1993; 1994). This notion of power structures as anchored in knowledge processes resembles Foucault's concept of

power as immanent relationships of force (1976, p. 121) that have their principle "not so much in a person as in a certain concerted distribution of bodies, surfaces, light, gazes, in an arrangement whose internal mechanisms produce the relation in which the individuals are caught up" (Foucault 1979, p. 202). While Foucault stresses the regulatory dispositions of the body, a sociology of artifacts would stress the hybrid character of power dispositions and the fact that these are not only embodied in human actors but also incorporated in artifacts.

Star has argued that standardization and regulation through technologies imply not only enlisting human actors to those technologies but also a process of exclusion, leaving out people for whom regulation costs (or alternatives) would be too high. Taking into account the fact that human actors are usually involved in several such hybrids at a time, one can consider the distribution of exclusion and inclusion a modality of exercising power: "Given that we are multiply marginal, given that we may interweave several selves with our technologies, both in design and use, where and what is the meeting place between 'externalities' and 'internalities'? . . . A stabilized network is only stable for some, and that is for those who are members of the community of practice who form/use/maintain it. And part of the public stability of a standardized network often involves the private suffering of those who are not standard—who must use the standard network, but who are also non-members of the community of practice" (Star 1991, p. 43). Therefore, a sociology of artifacts should inquire into the material, social, and symbolic technologies through which accessibility is distributed throughout society as well as into the effects of this distribution.

A further aspect we may examine is the technical-economic character of many networks and hybrids. In them, processes of economic exchange are embedded in a network of cognitive relationships that enlist heterogeneous sets of elements: human actors, machines, inscriptions, information technologies, and many more. They have a regulatory character, in the sense that they establish the possibilities for economic action, distributing and attributing the required skills and knowledge. It is hard nowadays to imagine forms of economic action and activities that are not dependent on information technologies, systems and assemblages of information-processing machines, systems of inscription, the intermingling of personal relationships with material technologies, systems of rapid transportation, production, and distribution machinery, sales dispositives, and so on. If economic processes are embedded in cognitive networks, if they unfold within the framework provided by hybrid concatenations of human actors and artifacts, then it should be possible (and definitely necessary) to analyze and describe the distribution of such networks throughout society and to show the cognitive lines along which they are constituted and along which they enlist participants. In the case of the Eurotunnel, we are confronted with a complex technical-financial network, some parts of which are distributed through the financial markets, some through political institutions, and some through transportation and information systems. Because this network requires continuous social, technical, and financial maintenance, surveillance, and repairs, it implies continuous translations and (re)distribution of properties among its parts, as well as between human actors and artifacts: for example, when its technical characteristics or technical events (accidents) affect the refinancing of its debt or when financial instruments available affect its technical possibilities. A sociological analysis of such a network would imply showing the cognitive lines along which translations and redistribution of properties from the financial to the technical nodes are effected, how these properties are imported and reimported on different sides of the network (Latour 1994, p. 798), and how they come to constitute structures of power.

The arguments formulated in the past decade by the sociology of knowledge and sci-

once make it hard for sociological theory to treat artifacts and things as on the margins of the social, unproblematic, or easy to ignore. This article argues that not only phenomena confined to a special branch of sociology or concerning only a particular social formation are at stake. The very way in which social order is achieved and reproduced, as well as core questions about society's organization modes, may well be reconsidered. Whether we call them just "things" or "artifacts", whether we deal with them directly or integrate them in complex hybrids, reconceptualizing our relationship to them will help us see the social world anew and move us toward a better understanding of how our relationship to things changes us.

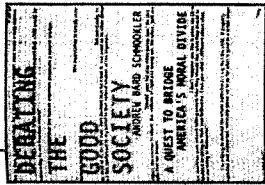
NOTES

1. One can of course ask about the social mechanisms through which the agency of things is relegated to the realm of aesthetical forms or to niches of popular culture, such as fantasy fiction, and what kinds of sociality evolve around these literary forms. But that is not the aim of the present paper.
2. This does not mean that all contemporary theories ignore these problems or that they were ignored in all classical sociological theories. Actually, the discussion about things has a long sociological tradition, from Marx, Durkheim, and Mauss through Mead (see McCarthy 1984; Cohen 1989; 1993) up to contemporary social theorists of commodification and consumption (e.g., McCracken 1990; Appadurai 1988). For reasons of space and focus, this sociological tradition cannot be discussed here extensively.
3. The sociology of knowledge and science is not alone in its interest in the "social life of things." Sociological analyses of consumption and commodification have also shed light on the processes through which artifacts and commodities acquire an active social existence (e.g., Slater 1997; Appadurai 1988; Gottdiener 1995; Douglas and Isherwood 1979; Baudrillard 1972). However, the sociology of knowledge and science formulates a series of general theoretical and methodological claims about the necessity of accounting for social order and sociality without leaving artifacts on the margins. The present article focuses on these claims.
4. I take here institutions, not in the sense of organizational structures, but as sets of rules and dispositives enacted in everyday (material and discursive) practices, acknowledged as such, that orient and constrain the doings of human actors.
5. It should be noted that the concept of network applied by Callon in the analysis of the connections among science, technology, and market processes differs from that of organization studies. While the latter defines networks as structural relationships between institutional actors, Callon and Latour emphasize a constellation of epistemic relationships that constitute the network's actants.

REFERENCES

- Appadurai, Arjun, ed. 1988. *The Social Life of Things*. Cambridge: Cambridge University Press.
- Ashmore, Malcolm, Robin Woolfitt, and Stella Harding. 1994. "Humans and Others, Agents and Things." *American Behavioral Scientist* 37:733-741.
- Barnes, Barry, David Bloor, and John Henry. 1996. *Scientific Knowledge: A Sociological Analysis*. Chicago: University of Chicago Press.
- Baudrillard, Jean. 1972. *Pour une critique de l'économie politique du signe* [A critique of the political economy of the sign]. Paris: Gallimard.
- Callon, Michel. 1986. "Some Elements of a Sociology of Translation: Domestication of the Scallops and the Fishermen of St. Brieuc Bay." Pp. 196-223 in *Power, Action and Belief: A New Sociology of Knowledge?*, edited by John Law. London: Routledge.
- _____. 1991. "Techno-Economic Networks and Irreversibility." Pp. 132-164 in *A Sociology of Monsters: Essays on Power, Technology, and Domination*, edited by John Law. London: Routledge.
- Callon, Michel and Bruno Latour. 1992. "Don't Throw the Baby Out with the Bath School! A Reply to Collins and Yearley." Pp. 343-368 in *Science As Practice and Culture*, edited by A. Pickering.
- Cohen, Joseph. 1989. "About Steaks Liking to Be Eaten: The Conflicting Views of Symbolic Interactionism and Talcott Parsons concerning the Nature of Relations between Persons and Nonhuman Objects." *Symbolic Interaction* 12:191-213.
- _____. 1993. "The Conflicting Views of Symbolic Interactionists and Talcott Parsons concerning the Nature of Relations between Persons and Nonhuman Objects: A Sequel to 'About Steaks Liking to Be Eaten.'" *Studies in Symbolic Interaction* 14:127-154.
- Derrida, Jacques. [1972] 1990. "Différance." Pp. 59-79 in *A Derrida Reader: Between the Blinds*, edited by Peggy Kamuf. New York: Columbia University Press.
- _____. 1992. *Given Time. I Counterfeit Money*. Chicago: University of Chicago Press.
- Douglas, Mary, and Baron Isherwood. 1979. *The World of Goods*. New York: Basic Books.
- Durkheim, Émile. [1915] 1947. *The Elementary Forms of the Religious Life: A Study in Religious Sociology*. Glencoe, IL: The Free Press.
- Mitchel, Foucault. 1976. *Histoire de la sexualité: La volonté de savoir* [History of sexuality, vol. I]. Paris: Gallimard.
- _____. 1979. *Discipline and Punish: The Birth of the Prison*. New York: Vintage Books.
- Fujimura, Joan. 1992. "Crafting Science: Standardized Packages, Boundary Objects, and Translation." Pp. 168-211 in *Science as Practice and Culture*, edited by A. Pickering.
- Giddens, Anthony. 1987. *Social Theory and Modern Sociology*. Cambridge: Polity Press.
- Gottdiener, Mark. 1995. *Postmodern Semiotics: Material Culture and the Forms of Postmodern Life*. Oxford: Basil Blackwell.
- Habermas, Jürgen. 1984. *The Theory of Communicative Action*. Vol. 1: *Reason and the Rationalization of Society*. Boston: Beacon Press.
- Haraway, Donna J. 1997. *Modest_Witness@Second_Millennium.FemaleMan®_Meets_OncoMouse™*. New York: Routledge.
- Heidegger, Martin. [1927] 1977. *Sein und Zeit* [Being and time]. Frankfurt: Vittorio Klostermann.
- Heintz, Bettina. 1993. *Die Innenwelt der Mathematik* [The inner world of mathematics]. Frankfurt: Campus.
- Henderson, Kathryn. 1991. "Flexible Sketches and Inflexible Databases: Visual Communication, Constriction Devices, and boundary Objects in Design Engineering." *Science, Technology, & Human Values*, 16(4):448-473.
- Hendriks, Ruud. 1997. "On Words and Clocks: Temporal ordering in a ward for autistic youths." Pp. 243-272 in *Ideas of Difference: Social Spaces and the Labour of Division*, edited by Kevin Hetherington and Roland Munro. Oxford: Blackwell.
- Knorr-Cetina, Karin. 1981. *The Manufacture of Knowledge: An Essay on the Constructivist and Contextual Nature of Scientific Knowledge*. Oxford: Pergamon.
- _____. 1992. "The Couch, the Cathedral, and the Laboratory: On the Relationship between Experiment and Laboratory in Science." Pp. 113-138 in *Science as Practice and Culture*, edited by A. Pickering.
- _____. 1997. "Sociality with Objects: Social Relations in Postsocial Knowledge Societies." *Theory, Culture and Society* 14(4):1-30.
- _____. 1999. *Epistemic Cultures*. Cambridge, MA: Harvard University Press.
- _____. forthcoming. "Objectual Practice." In *Thinking Practices: The Practice Approach in Social Thought*, edited by Karin Knorr-Cetina, Theodor Schatzki, and Eike von Savigny. New York: Routledge.
- Knorr-Cetina, Karin and Klaus Amann. 1990. "Image Dissection in Natural Scientific Inquiry." *Science, Technology, and Human Values* 15:259-283.
- Latour, Bruno. 1987. *Science in Action: How to Follow Scientists and Engineers through Society*. Cambridge, MA: Harvard University Press.
- _____. as Jim Johnson. 1988. "Mixing Humans with Non-Humans: Sociology of a Door-Opener." *Social Problems* 35:298-310.

- _____. 1988. *The Pastoralization of France*. Cambridge: Harvard University Press.
- _____. 1990. "Postmodern? No, Simply Amodern: Steps Towards an Anthropology of Science." *Studies in the History and Philosophy of Science* 21(2):145-171.
- _____. 1993. *We Have Never Been Modern*. Cambridge, MA: Harvard University Press.
- _____. 1994. "Pragmatologies: A Mythical Account of How Humans and Non-Humans Swap Properties." *American Behavioral Scientist* 37:791-808.
- _____. 1996. *ARAMIS, or the Love for Technology*. Cambridge, MA: Harvard University Press.
- Latur, Bruno, and Steve Woolgar. 1979. *Laboratory Life: The Social Construction of Scientific Facts*. Beverly Hills, CA: Sage.
- Law, John. 1993. *Organizing Modernity*. Oxford: Basil Blackwell.
- Luhmann, Niklas. 1990a. *Essays on Self-Reference*. New York: Columbia University Press.
- _____. 1990b. "The Paradox of System Differentiation and the Evolution of Society." Pp. 409-440 in *Differentiation Theory and Social Change: Comparative and Historical Perspectives*, edited by Jeffrey C. Alexander and Paul C. Colomy. New York: Columbia University Press.
- Lynch, Michael. 1985. *Art and Artifact in Laboratory Science: A Study of Shop Work and Shop Talk in a Research Laboratory*. London: Routledge and Kegan Paul.
- _____. 1993. *Scientific Practice and Ordinary Action: Ethnomethodology and Social Studies of Science*. Cambridge: Cambridge University Press.
- Marx, Karl. [1867] 1977. *Capital: A Critique of Political Economy*, vol. 1, translated by Ben Fowkes. New York: Vintage Books.
- Mauss, Marcel. [1925] 1954. *The Gift: Forms and Functions of Exchange in Archaic Societies*. London: Cohen and West.
- McCarthy, Doyle E. 1984. "Toward a Sociology of the Physical World: George Herbert Mead on Physical Objects." *Studies in Symbolic Interaction* 5:105-121.
- McCraeken, Grant. 1990. *Culture and Consumption*. Bloomington: Indiana University Press.
- Mead, George Herbert. 1982. *The Individual and the Social Self*, edited by David Miller. Chicago: University of Chicago Press.
- Mukerji, Chandra. 1993. "Territorial Gardens: The Control of Land in Seventeenth-Century French Formal Gardens". Pp. 66-101 in *The Culture of the Market*, edited by Thomas L. Haskell and Richard F. Teichgraber III. Cambridge: Cambridge University Press.
- _____. 1994. "Toward a Sociology of Material Culture: Science Studies, Cultural Studies and the Meanings of Things." Pp. 143-162 in *The Sociology of Culture: Emerging Theoretical Perspectives*, edited by Diana Crane. Oxford: Basil Blackwell.
- Pickering, Andrew, ed. 1992. *Science as Practice and Culture*. Chicago: University of Chicago Press.
- _____. 1995. *The Mangle of Practice: Time, Agency, and Science*. Chicago: University of Chicago Press.
- Rheinberger, Jorg. 1992. *Experiment and Subject: Experiment and writing*. Marburg.
- Schutz, Alfred, and Thomas Luckmann. 1973. *The Structures of the Life-World*. Evanston, IL: Northwestern University Press.
- Schatzki, Theodore R. 1996. *Social Practices: A Wittgensteinian Approach to Human Activity and the Social*. Cambridge: Cambridge University Press.
- Searle, John R. 1995. *The Construction of Social Reality*. London: Allan Lane.
- Slater, Don. 1997. *Consumer Culture and Modernity*. Cambridge: Polity Press.
- Star, Susan Leigh. 1989. "The Structure of Ill-Structured Solutions: Boundary Objects and Heterogeneous Distributed Problem Solving." Pp. 37-54 in *Distributed Artificial Intelligence*, vol. 2, edited by Les Gasser and Michael N. Huhns. London: Pitman.
- _____. 1991. "Power, Technology, and the Phenomenology of Conventions: On Being Allergic to Onions." Pp. 25-56 in *A Sociology of Monsters: Essays on Power, Technology and Domination*, edited by John Law. London: Routledge.
- Turner, Victor. 1969. *The Ritual Process*. Chicago: Aldine.



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